

Prüfbericht - Nr.: 19660049 001		Seite 1 von 16	
<i>Test Report No.:</i>		<i>Page 1 of 16</i>	
Auftraggeber: <i>Client:</i>		Honeywell Inc Automation and Control Solutions Honeywell International 1985 Douglas Drive North Dock 1 Golden Valley, MN 55422 USA	
Gegenstand der Prüfung: <i>Test item:</i>		Low Cost ISA100 Radio Module (51306799-001)	
Bezeichnung: <i>Identification:</i>	Low Cost Radio Module (LCRM)	Serien-Nr.: <i>Serial No.</i>	Engineering Sample
Wareneingangs-Nr.: <i>Receipt No.:</i>	1803014478	Eingangsdatum: <i>Date of receipt:</i>	23.09.2013
Prüfort: <i>Testing location:</i>		Refer Page 4 of 16 for test facilities	
Prüfgrundlage: <i>Test specification:</i>		FCC 15, Subpart C ANSI 63.10:2009	
Prüfergebnis: <i>Test Result:</i>		Der Prüfgegenstand entspricht oben genannter Prüfgrundlage(n). <i>The test item passed the test specification(s).</i>	
Prüflaboratorium: <i>Testing Laboratory:</i>		TÜV Rheinland (India) Pvt. Ltd. 82/A, 3rd Main, West Wing, Electronic City Phase 1 Hosur Road, Bangalore – 560 100. India FCC Registration No.: 176555	
geprüft / tested by:		kontrolliert / reviewed by:	
14.01.2014	Vinay N Engineer	16.01.2014	Raghavendra Kulkarni Senior Manager
<i>Datum</i> <i>Date</i>	<i>Name/Stellung</i> <i>Name/Position</i>	<i>Datum</i> <i>Date</i>	<i>Name/Stellung</i> <i>Name/Position</i>
	<i>Unterschrift</i> <i>Signature</i>		<i>Unterschrift</i> <i>Signature</i>
Sonstiges / Other Aspects: FCC ID:S5751306799			
Abkürzungen:	P(ass) = entspricht Prüfgrundlage F(ail) = entspricht nicht Prüfgrundlage N/A = nicht anwendbar N/T = nicht getestet	Abbreviations:	P(ass) = passed F(ail) = failed N/A = not applicable N/T = not tested
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. <i>This test report relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any safety mark on this or similar products.</i>			

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Test Result Summary

Clause	Test Item	Result
15.209	Spurious Radiated Emissions	Pass
15.207	Conducted Emissions	Pass

Note:

This Module is been originally approved with FCC ID: S5751306799. This module is been used in different host than it was certified earlier. Hence, class 2 Permissive change is been applied for the use of this module in a new Host.

This Report contains results of the module with the new host (SmartRadar Flexline).

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List of Test and Measurement Instruments

TUV Rheinland (India) Pvt. Ltd. , Bangalore

Equipment	Manufacturer	Model	S/N	Calibration Due Date
EMI Test Receiver	Rohde &Schwarz	ESU 40	100288	04.10.2014
Hybrid Log Periodic antenna	ETS Lindgren	3142D	00081354	26.07.2014
Broadband Horn Antenna	Frankonia	HAX-18	HAX18-802	23.03.2014
Double-Ridged Waveguide Horn Antenna	ETS Lindgren	116794	00133356	01.09.2014
Emission Horn Antenna	ETS Lindgren	116706	00107323	24.08.2014
Active Loop Antenna	Frankonia	LAX-10	LAX-10-800	11.04.2014
Spectrum Analyser	Agilent Technologies	E4407B	US41192772	21.03.2014

Testing Facilities:

- 1) TUV Rheinland (India) Private Limited
No. 108, West Wing
Electronic city Phase I
Bangalore – 560100

General Product Information

Product Function and Intended Use

Tank gauging is essential for the assessment of tank contents, tank inventory control and tank farm management. SmartRadar Flexline (SRFL) tank gauges help in accurate level gauging for refineries, tank terminals and petrochemical industries. Smart Radar maintains its ultra-high performance level on a wide range of applications and various tank conditions. The Enhanced Performance Signal processing enables the radar tank gauge to provide an accurate level reading even in difficult applications.

Ratings and System Details

Operating Frequency	2405-2475 MHz
No. of channel	15
Channel Spacing	5MHz
Transmitted Power	15dBm
Modulation	DSSS
Data Rate	250Kbps
Antenna Type	External
Number of antenna	2
Antenna Gain	As per Table 1
Supply Voltage	65V – 240V AC 50/60Hz 24V – 65V DC
Dimensions	320 X 450 X 200 (mm)
Environmental	-40 °C to +65 °C

Test Conditions:

Voltage: 120V AC 60Hz, 24V DC

Environmental conditions:

Temperature: +23 °C

RH: 62%

Operation Descriptions

The SmartRadar FlexLine (SRFL) is a radar-based level gauge to be used in inventory measurement systems.

Inside the enclosure following modules is as follows

CAN-PSX (Power Supply): Take input AC/DC supply and generate 15V DC for the internal Modules

HCM-BPM: Interface between SRFL & Communication Interface Module.

HCI-1WL: It is a combination of CAN-1WL Main Board, Low Cost ISA 100 Radio Module and CAN-1WL Barrier Board)

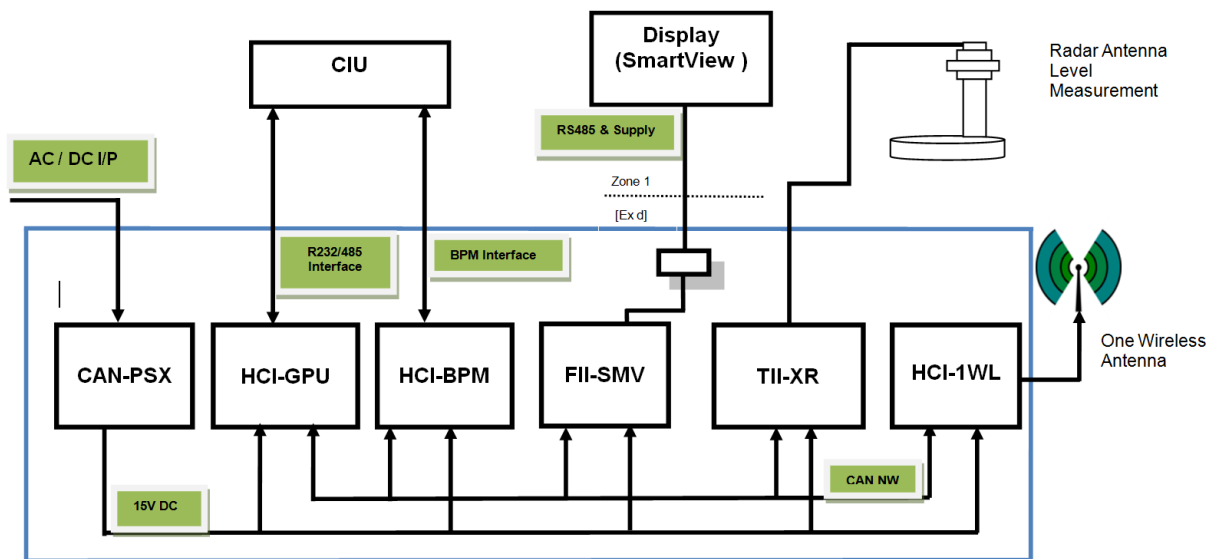
FII-SMV: This module is used to Interface with the Smart view display module placed on the SRFL.

HCI-GPU: Interface between SRFL and Communication Interface Module.

TII-XR: Transducer Interface Instrument –X Band Radar is used for the Level Measurement.

In SRFL, the modules (HCI-BPM, HCI-GPU, FII-SMV, TII-XR, HCI-1WL) will be interfaced through CAN Network. In the current revision of the SRFL, HCI-1WL board is modified to incorporate the Low Cost Radio board; this will occupy only a single slot in SRFL assembly.

Block Diagram



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Test Set-up and Operation Mode

Principle of Configuration Selection

The test was performed under continuous transmission to obtain the maximum emissions.

Test Operation and Test Software

A keypad embedded on PCB was used to enable the continuous transmission and changing channels (low/mid/high) on the EUT for the tests in this report.

Special Accessories and Auxiliary Equipment

-

Countermeasures to achieve EMC Compliance

- None

Table of carrier frequencies

Frequency Band	Channel No.	Frequency (MHz)
2400-2483.5 MHz	01	2405
	02	2410
	03	2415
	04	2420
	05	2425
	06	2430
	07	2435
	08	2440
	09	2445
	10	2450
	11	2455
	12	2460
	13	2465
	14	2470
	15	2475

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Antennas Used

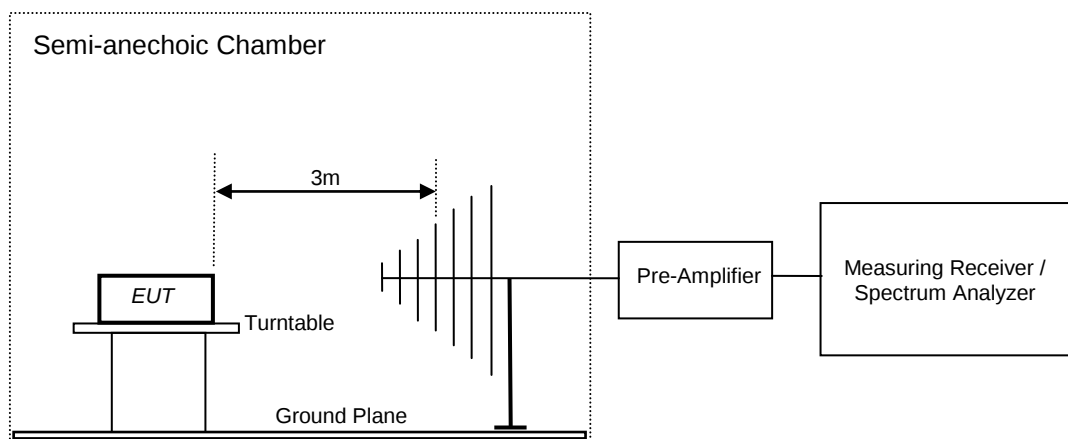
Antenna Number	Make	Model	Antenna Gain (dBi)	Power Level Setting (dBm)
Antenna 1	LCOM	HG2404U	4.0	15
Antenna 2	LCOM	HG2409U	8.5	15

Table 1

Test Methodology

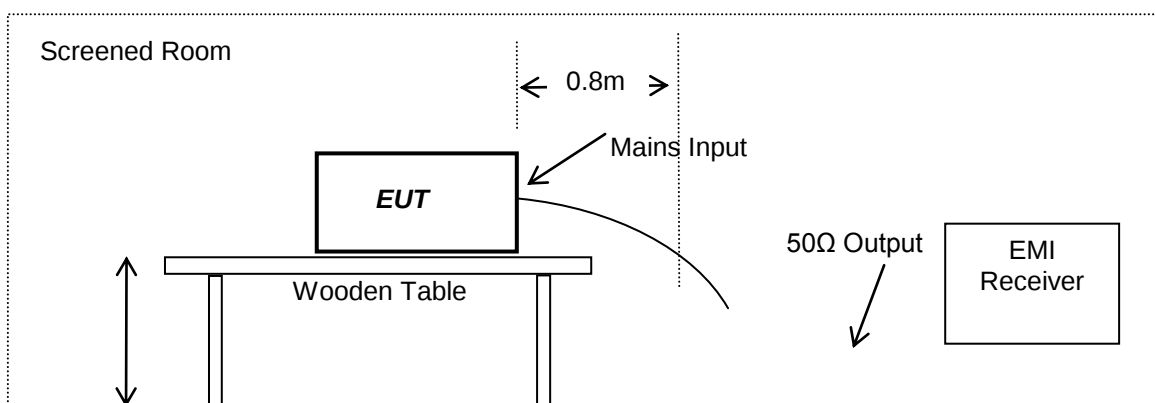
Radiated Emission Test

The radiated emission measurement was performed according to the procedures in ANSI C63.10-2001. The equipment under test (EUT) was placed at the middle of the 80 cm high turntable, and the EUT is 3 meters far from the measuring antenna. The turntable was rotated 360° for obtaining the maximum emission. The height of the measuring antennas was scanned between 1m and 4m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations. Repeat the measurement steps until the maximum emissions were obtained. The measurement above 1000MHz was performed by horn antenna. The measurement below 30MHz was performed by loop antenna. The EUT was rotated around the X-, Y-, and Z-Axis and the results from worst case axis are recorded.



Conducted Emission Test on a.c. mains line

The equipment under test (EUT) was placed on a wooden table 80cm above the ground plane, the LISN was placed 80cm away from the EUT. The test was performed in accordance with ANSI C63.4: 2003, with the following: an initial measurement was performed in peak and average detection mode on the live and neutral lines. The pre-scan was performed by peak detection on both live and neutral conductors. Any emissions recorded within 20dB of the relevant limit line were re-measured using quasi-peak and average detections, the 6 worst cases were recorded in the table of results.



Test Results

Spurious Radiated Emissions

Section 15.209

Result

Pass

Test Specification	FCC 15.207
Test Method	ANSI C63.10-2009
Measurement Location	Semi Anechoic Chamber
Supply Voltage	24 V DC and 120V 60Hz AC
Measuring Frequency Range	9kHz – 26GHz(Up to 10 th harmonic of the highest fundamental frequency)
Measuring Distance	3m
Detection	QP for frequency below 1GHz, Average for frequency above 1GHz
Requirement	The emission should not exceed the limits as mentioned in the table below

Limit for Radiated Emission of Section 15.209:

Frequency (MHz)	Field strength (μV/m)	Field strength (dBμV/m)	Distance of Measurement (m)
0.009 – 0.490	2400/F(kHz)	48.50 – 13.80	300*
0.490 – 1.705	24000/F(kHz)	33.80 – 23.00	30*
1.705 -30	30	29.54	30*
30-88	100	40.0	3
88-216	150	43.5	3
216-960	200	46.0	3
Above 960	500	54.0	3

Remark: * the limit shows in the table above of frequency range 0.009 – 0.490, 0.490 – 1.705 MHz and 1.705-30MHz is at 300 meter, 30 meter and 30 meter range respectively, which corresponds to 88,50 – 53.80, 53.80 – 43.00 and 49.5dBμV/m at 3m range by extrapolation calculation and the measurement of loop antenna.

The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9–90 kHz, 110–490 kHz and above 1000 MHz Radiated emission limits in these three bands are based on measurements employing an average detector.

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Test Results

This Product was tested with 120V AC and 24VDC. Only worst case results are reported.

For Frequency below 1GHz

Polarization	Frequency (MHz)	Emission level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
V	40.47	29.51	40.00	-10.49
	52.50	28.23	40.00	-11.77
	432.05	35.12	46.00	-10.88
	479.98	36.32	46.00	-9.68
	495.98	37.15	46.00	-8.85
	656.03	39.99	46.00	-6.01
H	256.30	30.21	46.00	-15.79
	352.04	34.63	46.00	-11.37
	431.96	34.12	46.00	-11.88
	656.03	39.59	46.00	-6.41

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For Frequency above 1GHz
Antenna 1: 4dBi

Channel	Polarization	Frequency (MHz)	Emission (dBuV/m)	Limit (dBuV/m)	Margin (dB)
Low	V	2390 (Pk)	60.68	74	-13.32
		2390(Av)	49.96	54	-4.04
		2405(Pk)	107.31	-	*
		2405 (Av)	104.08	-	*
		No Harmonics Found			
	H	2390 (Pk)	49.63	74	-24.37
		2390(Av)	39.79	54	-14.21
		2405(Pk)	100.35	-	*
		2405 (Av)	96.44	-	*
		No Harmonics Found			
Mid	V	2440 (Pk)	107.36	*	-
		2440 (Av)	104.21	*	-
		No Harmonics Found			
	H	2440 (Pk)	98.04	*	-
		2440 (Av)	94.27	*	-
		No Harmonics Found			
High	V	2475 (Pk)	107.2	-	*
		2475 (Av)	103.94	-	*
		2483.5 (Pk)	58.06	74	-15.94
		2483.5 (Av)	49.92	54	-4.08
		No Harmonics Found			
	H	2475 (Pk)	99.11	-	*
		2475 (Av)	95.32	-	*
		2483.5 (Pk)	47.13	74	-26.87
		2483.5 (Av)	38.96	54	-15.04
		No Harmonics Found			

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Antenna 2 : 8.5 dBi

Channel	Polarization	Frequency (MHz)	Emission (dBuV/m)	Limit (dBuV/m)	Margin (dB)
Low	V	2390 (Pk)	64.13	74	-9.87
		2390(Av)	52.44	54	-1.56
		2405(Pk)	107.53	-	*
		2405 (Av)	104.37	-	*
		No Harmonics Found			
	H	2390 (Pk)	48.31	74	-25.69
		2390(Av)	39.33	54	-14.67
		2405(Pk)	95.8	-	*
		2405 (Av)	91.94	-	*
		No Harmonics Found			
Mid	V	2440 (Pk)	106.95	*	-
		2440 (Av)	103.25	*	-
		No Harmonics Found			
	H	2440 (Pk)	99.23	*	-
		2440 (Av)	93.25	*	-
		No Harmonics Found			
High	V	2475 (Pk)	107.42	-	*
		2475 (Av)	104.19	-	*
		2483.5 (Pk)	58.25	74	-15.75
		2483.5 (Av)	50.49	54	-3.51
		No Harmonics Found			
	H	2475 (Pk)	95.17	-	*
		2475 (Av)	91.32	-	*
		2483.5 (Pk)	44.54	74	-29.46
		2483.5 (Av)	35.68	54	-18.32
		No Harmonics Found			

Conducted Emission Test on a.c. Power Line**Section 15.207****Result****Pass**

Test Specification : FCC Part 15 Section 15.207
Test Method : ANSI C63.4-2003
Testing Location : Screened room
Measurement Bandwidth : 9kHz
Frequency Range : 150kHz – 30MHz
Supply Voltage : 120V AC

Limit of section 15.207

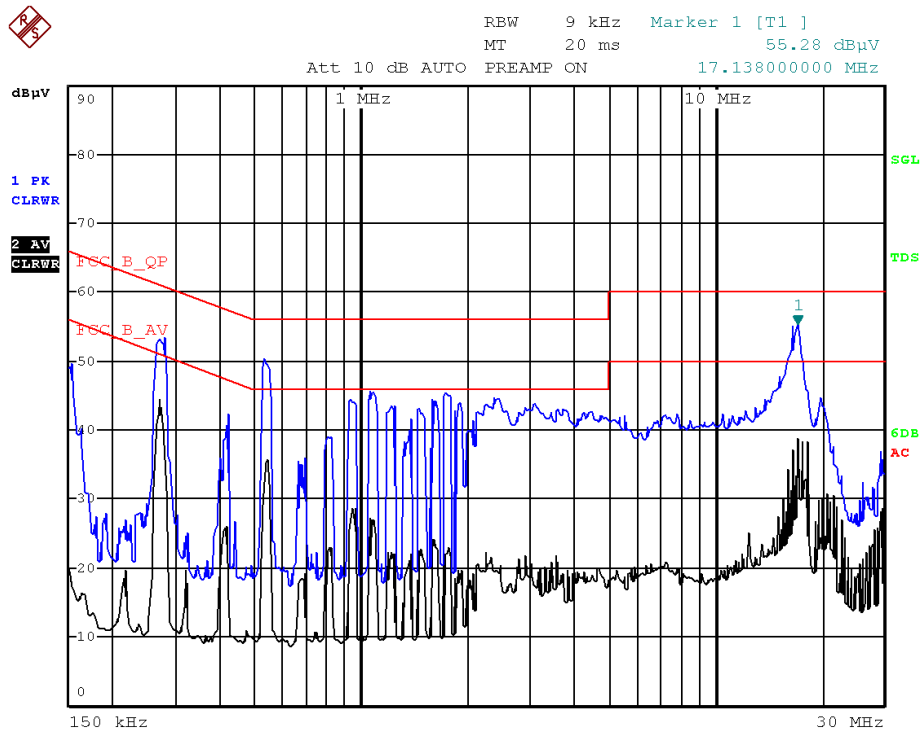
Frequency of emission (MHz)	QP Limit (dB μ V)	AV Limit (dB μ V/m)
0.15 – 0.5	66 – 56*	56 – 46*
0.5 – 5	56	46
5 – 30	60	50

* Decreases with the logarithm of the frequency

Test Result:

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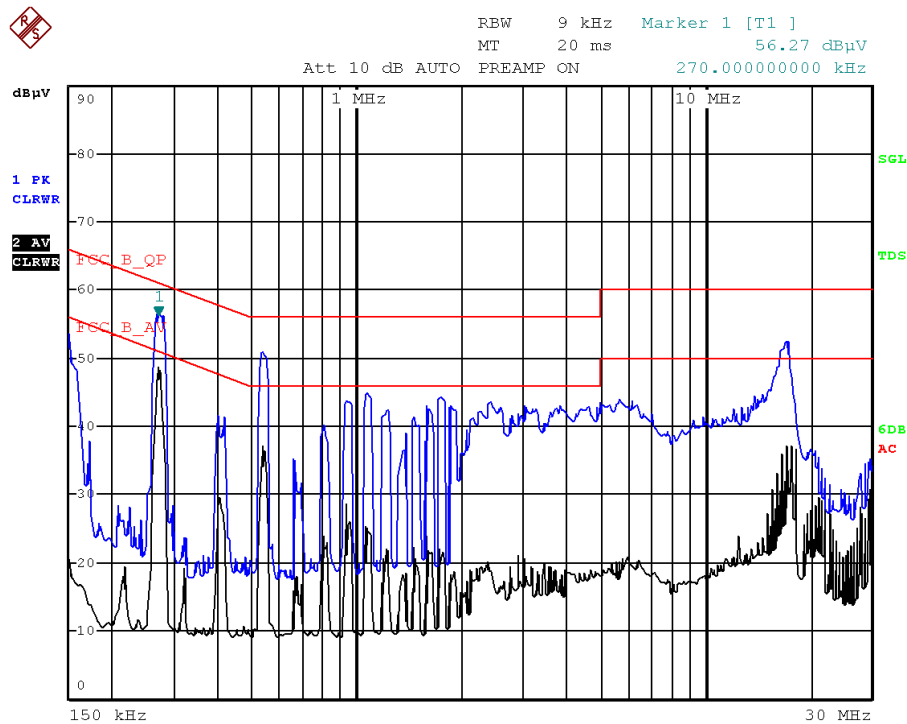
Mode: Line



EDIT PEAK LIST (Final Measurement Results)				
Trace1:	FCC_B_QP			
Trace2:	FCC_B_AV			
Trace3:	---			
TRACE	FREQUENCY	LEVEL dBμV		DELTA LIMIT dB
2 Average	270 kHz	44.13	L1	-6.98
1 Quasi Peak	530 kHz	47.85	L1	-8.14
1 Quasi Peak	278 kHz	51.12	L1	-9.74
2 Average	542 kHz	34.93	L1	-11.06
2 Average	18.134 MHz	38.40	L1	-11.59
1 Quasi Peak	17.138 MHz	47.30	L1	-12.69
2 Average	17.126 MHz	37.07	L1	-12.92
2 Average	16.622 MHz	36.63	L1	-13.36
1 Quasi Peak	1.066 MHz	42.41	L1	-13.58
1 Quasi Peak	1.726 MHz	41.16	L1	-14.83
2 Average	16.118 MHz	33.53	L1	-16.47
1 Quasi Peak	154 kHz	40.42	L1	-25.35

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Mode: Neutral



EDIT PEAK LIST (Final Measurement Results)				
Trace1:	FCC_B_QP			
Trace2:	FCC_B_AV			
Trace3:	---			
TRACE	FREQUENCY	LEVEL dBμV		DELTA LIMIT dB
2 Average	270 kHz	48.39	N	-2.72
1 Quasi Peak	266 kHz	54.90	N	-6.33
1 Quasi Peak	534 kHz	48.72	N	-7.27
2 Average	534 kHz	36.61	N	-9.38
2 Average	17.13 MHz	37.24	N	-12.75
2 Average	18.138 MHz	36.18	N	-13.81
2 Average	17.634 MHz	35.94	N	-14.05
1 Quasi Peak	1.07 MHz	41.46	N	-14.53
1 Quasi Peak	17.226 MHz	44.24	N	-15.75
1 Quasi Peak	1.75 MHz	40.09	N	-15.90
1 Quasi Peak	150 kHz	43.00	N	-22.99